

REMARKS

By this amendment, claims 1, and 4-13 have been amended. Claims 2, 3 have been cancelled. Claim 16 was previously cancelled.

Claims 1, and 4-15 remain pending in the application. Reconsideration and allowance of all of the claims are respectfully requested in view of the foregoing amendments and of the following remarks.

No new matter has been added to the application by way of the present amendment.

In regard to the Rejection of claims 1 and 2, under 35 USC 102 (b)

The Examiner has rejected claims 1 and 2 under 35 U.S.C. § 102(b), as being anticipated by Winterberg et al. (WO 01/82403). The Applicants disagree.

Claim 2 has been cancelled.

The Examiner's attention is drawn to the preamble of amended claim 1:

1. A process of co-extrusion of a thin electrode sheet with a thin electrolyte polymer sheet directly onto a current collector sheet to form a bi-face assembly for a lithium polymer battery,...

The Examiner's attention is also drawn to the step (g) and (j) of amended claim 1:

(g) extruding said first electrode slurry in the form of a first thin electrode sheet through a first die opening connected to said first flow channel directly onto a first side of a moving current collector sheet;

(j) extruding said second electrode slurry in the form of a second thin electrode sheet through a third die opening connected to said third flow channel directly onto a second side of the moving current collector sheet;

Steps (g) and (j) of amended claim 1 specifically define that a first electrode slurry is extruded directly onto a first side of a moving current collector sheet and a second electrode slurry is extruded directly onto a second side of the moving current collector sheet in order to form a bi-face assembly as defined in the preamble of amended claim 1.

The Applicants submit that at least the above features of claim 1 are not taught by Winterberg et al. Winterberg et al. discloses in paragraphs [0040] and [0078] :

[0040] ... Current collector foils are then laminated onto the electrode/polymer/electrode compound.

[0078] The extrusion nozzle (5) forms the battery components anode substance (11), polymer gel electrolyte (13) and cathode substance (15) to a suitable thickness and width. The next process step is the laminating with help of laminating rollers (6) where the layers formed by the extrusion nozzle are (5) laminated onto the current collector foils (8,9). The current collector foils are copper foil or mesh (8) or aluminum foil or mesh (9). After that the lithium polymer cell is wound.

As shown in Figure 1, Winterberg et al. discloses a method of extruding a multilayer assembly consisting of electrode/polymer/electrode and laminating two Current collector foils (8,9) on each side of the multilayer assembly to form a mono-face assembly wherein only one face or one side of the current collectors are in contact with their respective electrodes.

Therefore, Winterberg et al. do not teach extruding a first electrode slurry directly onto a first side of a moving current collector sheet and extruding a second electrode slurry directly onto a second side of the moving current collector sheet in order to form a bi-face assembly as defined in the preamble of amended claim 1.

Therefore, at least one element of amended claim 1 is not taught by Winterberg et al. As such, the Examiner is requested to withdraw his rejection of claim 1.

In regard to the Rejection of Claims 3-5, 7, 10 and 11 Under 35 U.S.C. § 103(a)

The Examiner rejected claims 3-5, 7, 10 and 11 under 35 USC 103 (a) as being unpatentable over winterberg et al. in view of Barton et al. (US 6,503,432) and Kim et al. (US 6,403,432). The Applicants respectfully disagree.

Claim 3 has been cancelled.

As discussed above with respect to claims 1 and 2, the above feature of amended claim 1 is not taught by winterberg et al. The Applicants submit that this deficiency in winterberg et al. is not remedied by Barton et al., without admitting that the two references can be combined and reserving the right to argue thereagainst in the future.

Referring to lines 36-53 of column 12 of Barton et al. describing the possibility of making a multilayer assembly:

The support 40 may also be a structure comprising one or more battery layers. For example, the support may be a composite structure comprising a separator layer and an electrode layer. The composite support structure may be formed separately according to the process of the invention, or using other conventional battery processing methods. The composite support structure may include a substrate, which may be a permanent part of the battery structure, or may be removed prior to assembly of the final battery cell. It will be understood that the composite support structure may comprise other combinations of battery layers.

The composite structure of separator and electrode may also be extruded onto a temporary support (not shown). The temporary support may be a plastic releasable substrate, such as polyester, optionally coated with a release agent. Deposition onto the plastic support may be followed by winding into a roll for storage. The structure may then be laminated to a current collector at a later time.”

Barton et al. do not teach extruding a first electrode slurry directly onto a first side of a moving current collector sheet and extruding a second electrode slurry directly onto a second side of the moving current collector sheet in order to form a bi-face assembly as defined in the preamble of amended claim 1.

The Applicants submit that the deficiencies in winterberg et al. and in Barton et al. are not remedied by Kim et al., without admitting that the two references can be combined and reserving the right to argue thereagainst in the future.

Referring to lines 52-65 of column 7 of Kim et al. describing the manufacturing method of a lithium secondary battery:

“Cathode 6 is manufactured by coating commonly used lithium metal oxide onto a current collector, aluminum foil 8. The lithium metal oxide is coated on both sides of aluminum foil 8 to a thickness of 20-100 μm .

Anode 1 is manufactured by coating commonly used lithium metal onto both sides of a current collector, copper foil 10 to a thickness of 25-50 μm .

Between cathode 6 and anode 1, polymer electrolyte 4 is provided. Polymer electrolyte 4 can be provided between cathode 6 and anode 1 by directly coating the polymer electrolyte solution onto cathode 6 or anode 1, or by forming a film using the polymer electrolyte solution by means of a doctor blade method and then attaching thus obtained film onto cathode 6 or anode 1.”

It is apparent that Kim et al. a standard solvent coating process in which the main components i.e. cathode 6 and anode 1, are coated on their respective current collector and thereafter, the polymer electrolyte 4 is somehow provided between cathode 6 and anode 1.

The Examiner's attention is drawn to the following features of amended claim 1:

- (g) extruding said first electrode slurry in the form of a first thin electrode sheet through a first die opening connected to said first flow channel directly onto a first side of a moving current collector sheet;
- (h) concurrently extruding said first electrolyte slurry in the form of a first thin electrolyte sheet through a second die opening adjacent to said first die opening and connected to said second flow channel, said first thin electrolyte sheet being extruded directly onto said first thin electrode sheet;
- (j) extruding said second electrode slurry in the form of a second thin electrode sheet through a third die opening connected to said third flow channel directly onto a second side of the moving current collector sheet; and
- (k) concurrently extruding said second electrolyte slurry in the form of a second thin electrolyte sheet through a fourth die opening adjacent to said third die opening and connected to said fourth flow channel, said second thin electrolyte sheet being extruded directly onto said second thin electrode sheet.

Kim et al. neither teach nor suggest to concurrently extrude a first and second electrolyte sheet onto a first and second electrode sheet on each side of a current collector sheet.

Therefore, at least one element of amended claim 1 is not taught by Winterberg et al. nor is it taught by Barton et al. or kim et al. alone or in combination. As such, the Examiner is requested to withdraw his rejection of amended claim 1 and claims 3-5, 7, 10 and 11 depending therefrom.

In regard to the Rejection of Claims 6, 8 and 9 Under 35 U.S.C. § 103(a)

The Examiner rejected claims 6, 8 and 9 under 35 USC 103 (a) as being unpatentable over winterberg et al. in view of Barton et al. (US 6,503,432) and Kim et al. (US 6,403,432) as applied to claims 3-5, 7, 10 and 11, and further in view of Fukumura et al. (US 5,674,556). The Applicants respectfully disagree.

Referring to lines 6-13 of column 6 of Fukumura et al. describing the embodiments shown in Figs. 7A and 7B:

“Examples of coating apparatus having no backup roll are shown in FIGS. 7A and 7B for reference. The examples show embodiments different from that of the present invention. As is shown in FIGS. 7A and 7B, slot dies 7 and 7 may be placed on opposite sides of the support 1, with a clearance between the support 1 and them, in which case the slot dies 7 and 7 may be placed in opposition to each other (FIG. 7A), or they may be placed away from each other (FIG. 7B).”

It is apparent that Fukumura et al. does not describe a central channel in the multiple slot die as defined by claims 6, 8 and 9 but simply a clearance or space between two slot dies. As such, the Examiner is requested to withdraw his rejection of claims 6, 8 and 9.

In regard to the Rejection of Claims 12-15 Under 35 U.S.C. § 103(a)

The Examiner rejected claims 12-15 under 35 USC 103 (a) as being unpatentable over winterberg et al. as applied to claims 1 and 2, in view of applicant's admitted prior art.

The applicants submit that claims 12-15 are all dependent on amended claim 1 which the applicant believes is now in condition for allowance. Claims 12-15 are therefore allowable as dependent on an allowable claim.

In view of the above remarks, the Applicants respectfully submit that all of the currently pending claims are allowable and that the entire application is in condition for allowance.

Should the Examiner believe that anything further is desirable to place the application in a better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number listed below.

At the time of filing of the present response, the Office was authorized to charge the fees believed to be necessary to a credit card. In case of any under- or over-payment or should any additional fee be otherwise necessary, the Office is hereby authorized to credit or debit (as the case may be) Deposit Account number 502977.

Respectfully submitted,

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